present borders. Malaspina Glacier has shrunk more than the Bering, but even this is far nearer the maximum than the glaciers of Prince William Sound toward the west, or those of the Inside Passage to the southeast, or those of the interior to the north. In the same region with Malaspina Glacier, the expansion of the Nunatak-Hidden Glacier, of a century or more ago, extended to within 10 or 15 miles of the earlier maximum.

From these facts it is evident that locally, near the center of the coastal area of Alaskan glaciation, the present day glaciers are only a little short of their former maximum. This may be due to recent extensive uplift of the mountains in which these glaciers have their source, or to other local causes; or the entire history of Alaskan glaciation may be related to changes in elevation, and wholly unrelated to those causes that gave rise to the development of continental glaciation in Europe and eastern North America. We are not now in possession of a sufficient body of fact to warrant further discussion of this problem.

CONCLUSION

This brief analysis makes it clear that up to the present time only a beginning has been made in the research in the field of Alaskan glaciers and glaciation. Enough has been done, however, to show the existence of interesting and important problems, to permit a few of them to be set forth in concrete form, and to discover facts that have a bearing upon some of them. But there is so much yet to be learned, so many more facts are needed, there is so wide a field that is wholly unknown, and the period of observation is so limited that any one who undertakes to consider the general problems of this broad and complicated field can not but feel appalled at the limitations surrounding his attempt. At best, with all the help that he can obtain from the work of others, he can only hope to make a step toward the understanding of the conditions and problems of this great field. I do not delude myself with the belief that in this address I have done more than this.

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Cornell University

PROFESSOR GEORGE DAVIDSON

In San Francisco on December 1, 1911, Professor George Davidson quietly ended a long life of active and valuable service to his country. Men of science the world over are expressing their sorrow at his passing, but everywhere there swells also the strong note of pride and satisfaction in the magnificent example which he has given of what may be accomplished by the devotion of a clean, strong life to a chosen field of work. Beginning his independent scientific observations in 1843 as magnetic observer for Girard College, he devoted sixty-eight years of virile manhood to geodesy, geography and astronomy. For fifty years of this long period he was uninterruptedly in the service of the United States Coast and Geodetic Survey. Three years after his retirement in 1895 from the survey he was elected to the professorship of geography in the University of California, with which institution he was connected to the time of his death. This change in his nominal employment made, however, no serious break in the continuity of his life of study and research. The exceptional character of his mental and physical virility is strikingly shown by his election to the faculty of the University of California at the age of 73—eight years beyond the limit usually fixed for the retirement of college professors.

Few men can read the brief sketch which follows without some feeling of surprise that the life of a contemporary should reach so far back into the history of another generation. Born in Nottingham, England, on May 9, 1825, in early boyhood he was brought to the United States by his parents, who settled in

Pennsylvania in 1832. He was educated in the Central High School of Philadelphia, an institution which by the school organization of that time was entitled to confer college degrees and which had an able corps of instructors. Among the faculty was Professor A. Dalles Bache. Professor Bache's high regard for the young student led to his appointment, in 1843, as magnetic observer at Girard College. Meanwhile Professor Bache was made superintendent of the United States Coast Survey and in 1845 young Davidson, then only 20 years of age, was appointed as clerk and computer to serve in the office of the superintendent. This appointment determined his life work, for he remained in the service just one half century. In 1850 at his request he was assigned to duty on the Pacific coast, where for the next ten years he surveyed harbors, selected sites for lighthouses and determined geographical positions along the coast from San Diego to Puget Sound. This pioneer work was of the greatest importance to navigators, his observations during this period being the foundation for his "Coast Pilot or Directory of the Pacific Coast," the first edition of which appeared in 1857.

At the outbreak of the civil war he was assigned to the Atlantic coast, where he was first employed as engineer on the defenses of the Delaware River. In 1862 he was in charge of the Coast Survey steamer *Vixen*, detailed for special naval service along the Florida coast. The next year, when Lee invaded Pennsylvania, he was made assistant engineer of Philadelphia.

The frequent connection of Professor Davidson with important events in the history of the United States is well illustrated by his assignments for the year 1867. In January he was detailed on duty as engineer of a party sent to the Isthmus of Panama to search for the best location for a ship canal. A few months later he was in Alaska making a preliminary geographical survey of that territory, the purchase of which was then being negotiated by the United States. His report on Alaska met the warm approval of Secretary of State Seward, and greatly influenced the consummation of the purchase. One rare accomplishment of Professor Davidson was his ability to do reconnaisance quickly and effectively—an especially valuable quality for a man doing scientific work in a new country.

In 1868 he was promoted to charge of the United States Coast Survey on the Pacific coast, a position which he retained until June, 1895. This period was in many ways the richest and most productive of his life. He not only directed the work of the various field parties and personally made some notable geodetic and astronomical surveys, but he also served on government commissions in various parts of the world.

In 1872 and again in 1884 he was appointed by the President upon the Assay Commission to test the weight and fineness of the coins of the Philadelphia Mint, and in both instances made all the weighings and introduced new methods. Twice he was appointed by the Secretary of the Treasury to examine the assay, coin and bullion weights and the ballances and beams of the United States Mint at San Francisco.

In 1873 he was appointed by President Grant one of the three commissioners of irrigation of California, and in the following year was sent to China, India, Egypt and Europe to examine and report upon irrigation and reclamation works. In 1888 President Cleveland appointed him a member of the Mississippi River Commission. In 1889 he was appointed by President Harrison a delegate to the International Geodetic Convention at Paris, and was commissioned to bring to Washington the international prototypes of the standard meter and kilogram. While abroad on this mission he visited the observatories of Paris, Berlin and Greenwich, and was received with high honors.

Many scientific societies have elected him to membership: Bureau des Longitudes de France; honorary member Berlin Geographische Gesellschaft; Royal Geographical Society; Scottish Royal Geographical Society; Swedish Society of Anthropology and Geography; Paris Academy, Institut de France; the Philadelphia Academy of Science in 1853;

of the National Academy of Science in 1874, and many others. He was president of the Geographical Society of the Pacific since its organization in 1881. He received the degree of Ph.D. from Santa Clara College in 1876; Sc.D. from the University of Pennsylvania in 1889, and LL.D. from the University of California in 1910. Norway conferred upon him the Cross of the Royal Order of St. Olaf in 1907, and the American Geographical Society awarded him the Charles P. Daly medal in 1908.

In California he was frequently called upon to give advice in the great engineering problems of San Francisco and of the state. He served as regent of the University of California from 1877 to 1884, and was a member of many state commissions. It was largely through his suggestion and influence that James Lick finally decided to build and endow the great Lick Observatory.

Professor Davidson is also favorably known for his accurate astronomical work. He was in charge of the solar eclipse expedition to Alaska in 1869 and took his 6½-inch equatorial to the top of Santa Lucia (over 6,000 feet) to observe the total eclipse of 1880. He had charge of the American Transit of Venus Expedition to Japan in 1874 and of the party to New Mexico for the transit of 1882. The Davidson Observatory in Lafayette Park, San Francisco, where he made many valuable observations, was established and maintained by him for twenty years. His remarkably fine drawing of Saturn is a monument to his acute eyesight and to his delicate skill in delineation.

The name of Davidson is inseparably connected with the foundations of accurate map work in the state of California. His long study of the coast line is embodied in the many survey charts and in the final edition of his "Coast Pilot," which was published in 1889. The north-flowing current now known as the Davidson inshore eddy, was discovered by him and studied particularly in regard to its effect upon harbor improvements.

The only base lines in California, the lines upon which all the distances involved in the extensive triangulation of the state depend, were located and accurately determined by Professor Davidson, the Yolo base line being twice measured by him in 1881 and the Los Angeles base line three times in 1888–89. A recent report of the Coast and Geodetic Survey puts the probable error in this work as about the one-ten-thousandth part of one per cent. The location of the northeastern boundary line of California, the 120th meridian, was finally determined by him in 1873, and the diagonal boundary of 405 miles from Lake Tahoe to the Colorado River was located and marked under his supervsion in 1893. This line is interesting because at each end it terminates in a body of water.

This fragmentary account affords but an imperfect idea of the breadth and scope of the work of Professor Davidson. The fact that in all the many problems of his main work his scientific accuracy stands practically unchallenged is due to his wonderful capacity for untiring effort, to his acute eyesight as an observer, and to his fixed habit of patiently and conscientiously verifying every observation.

In the seventies, when reoccupation of some of his old stations by later parties threw some doubt on his observations fixing the exact position of Mt. Tamalpais, he boldly asserted that his work was right, that the mountain might have moved, but that he had correctly determined its location at the time. After the earthquake of 1906 there was made a careful and extensive survey of central California, which, compared with the surveys before and after the earthquake of 1868, confirmed the accuracy of Professor Davidson's original observations and also his explanation of the apparent discrepancies.

Simple and unassuming in appearance, he bore the mark of one accustomed to command, and possessed a strong and dominating personality. The men who served under him learned at once to obey unquestioningly his slightest order, yet his warm-hearted and generous nature caused them to be strongly attached to him. It has been said that his life work extended through sixty-eight years of active manhood, and rightly so, although one in-

firmity partially disabled him in later years. He was made professor emeritus in 1905 and freed from any obligation to do university work, yet he voluntarily continued his classes for two years in spite of failing eyesight. The necessity of submitting to an operation for cataract finally compelled him to give up lecturing. Although the operation was but partially successful, several papers were prepared by him in these later years. Professor Davidson's indomitable will kept him at work when he was able to read only through a narrow slit in blackened cardboard under favorable light and with the help of the strongest glasses.

Under such circumstances he wrote and published in 1908 his paper on "Francis Drake on the Northwest Coast of America" and, in 1910, the paper on "The Origin and Meaning of the Name California." Both these papers necessitated the careful reading of old maps and manuscripts and yet every point was verified and compared in his manuscript and also in final proof with his original source of information.

To the last he stood as erect as a young soldier, and his voice rang with the courage that he never lost. To those who knew him personally his memory will be treasured because of his warm heart and manly character. The record of his life is an inspiration toward untiring conscientious scientific work.

RULIFF S. HOLWAY

MUSEUM EXTENSION WORK IN CHICAGO

THREE years ago the Chicago Academy of Sciences undertook an educational and museum extension policy which was new in that city. The work has been done in cooperation with the public and private schools of the city. Nearly one hundred museum loan collections have been prepared for distribution among the schools. During the year 1911, 279 loans were made to 44 different schools. Each collection thus loaned was used with at least fifty children and, in many cases, with several hundred children before it was returned to the academy. It is estimated that in this way the loan collections have been used during the past year with upwards of 20,000 children.

Instructional courses were offered at the academy free of charge to the children who wished to come. These classes were so crowded that a delegate plan was devised which is probably unique in museum work. Each school room of a given grade may select a representative and that representative comes to the academy as a "little reporter." With note-book and pencil in hand, and with ready questions, these "reporters" make every effort to be well prepared to transmit to their classmates the lessons of which they have had the advantage. In this way the instructional work of the academy has been reaching thousands of children in the public schools each week. Fifty-six schools were represented by 553 delegates in the instructional courses at the academy. Through this method of representatives from the different classes, the work of the academy during the past year has been reported to many children.

Instructional courses to teachers were given. Some of these courses were in the laboratory and others in the field. The teachers were organized into groups to carry on special studies in the plant and animal life of the Chicago region. The study of birds and wild flowers were perhaps the most popular courses thus undertaken.

The transition of the academy from a natural history museum, organized chiefly for the benefit of its members, to an active educational institution conducted chiefly for the benefit of the community, has been carried on under the leadership of the president, Professor T. C. Chamberlin, head of the department of geology at the University of Chicago. The educational work was entrusted, three years ago, to Dr. Wallace W. Atwood, who has had immediate charge of the development of this phase of museum extension work and has organized the various courses of instruction and the methods of taking the museum to the people and especially to the children in the schools. Mr. La Verne W. Noyes, president of the board of trustees, has taken an active interest in the development of this